[Document Name] Claims

[Claim 1]

A solar cell module comprising a plurality of flat plate solar cell elements electrically connected to one another and disposed between a translucent panel and a back surface protective member with a space between the adjacent solar cell elements being filled with a filler member, wherein

each of the solar cell elements includes a light receiving surface electrode that is provided on a light receiving surface side of the solar cell element, the light receiving surface electrode including three bus bar electrodes for retrieving outputs and a plurality of finger electrodes that are disposed to perpendicularly cross the bus bar electrodes,

each of the bus bar electrodes has a width of not less than 0.5 mm and not more than 2 mm, and

each of the finger electrodes has a width of not less than 0.05 mm and not more than 0.1 mm.

[Claim 2]

The solar cell module according to claim 1, wherein each of the finger electrodes has a width of not less than 0.06 mm and not more than 0.09 mm.

[Claim 3]

The solar cell module according to claim 1 or 2,

wherein the finger electrodes are in contact with the filler member.

[Claim 4]

The solar cell module according to any one of claims 1 to 3, wherein each of the solar cell elements includes on the light receiving surface side thereof an opposite conductivity-type diffusion layer having a sheet resistance of not less than 60 Ω/□ and not more than 300 Ω/□.

[Claim 5]

The solar cell module according to any one of claims 1 to 4, wherein each of the solar cell elements includes on the light receiving surface side thereof a great number of fine irregularities each having a width and a height of 2 μm or less and an aspect ratio of 0.1 to 2.

[Document Name] Specification

[Title of the Invention] Solar Cell Module

[Technical Field]

[0001]

The present invention relates to a solar cell module using polycrystalline silicon solar cell elements.

[Background Art]

[0002]

A solar cell is used for converting energy of incident light into electrical energy. The major types of solar cells are classified into crystalline, amorphous, and compound types depending on the kinds of the material used. Most of the solar cells that are currently distributed in the market are crystalline silicon solar cells. The crystalline silicon solar cells are further classified into monocrystalline type and polycrystalline type. An advantage of the monocrystalline silicon solar cells is that improvement of conversion efficiency is easy because of high quality substrates, while a disadvantage thereof is a high production cost of the substrates. On the other hand, though the polycrystalline silicon solar cells have a drawback that the improvement of conversion efficiency is difficult due to inferior quality of substrates, they have an advantage that they can be produced at a low cost. In addition, with the recent improvement in substrate quality

and progress in cell fabrication technology of the polycrystalline silicon substrates, conversion efficiency of about 18% has been achieved at research level.

[0003]

Meanwhile, since the polycrystalline silicon solar cells are mass-produced at low cost, they have conventionally been distributed in the market, and are today's mainstream solar cells.

[0004]

Shown in Fig. 2 and Fig. 3 is a typical structure of a solar cell element. Shown in Fig. 3(a) is a diagram showing a structure of a section of a solar cell element X. Shown in Fig. 4 is a diagram showing one example of electrode shape, wherein (a) is a light receiving surface side (surface), and (b) is a non-light receiving surface (back surface).

[0005]

The solar cell element X is produced as described below.

[0006]

A silicon substrate 1 of a p-type semiconductor having a thickness of about 0.3 to 0.4 mm, a size of 100 to 150 mm^2, and made from monocrystalline silicon, polycrystalline silicon, or the like is prepared. An n-type diffusion layer 1a is formed on the silicon substrate

1 to obtain a semiconductor junction part 3. The n-type diffusion layer 1a is formed as the n-type diffusion layer 1a having a thickness of about 0.2 to 0.5 μm by diffusing phosphor atoms which are n-type impurities on an entire surface of the silicon substrate 1 by placing the silicon substrate in a diffusion furnace and heating in phosphorous oxychloride ($POCl_3$). After that, parts of the diffusion layer at a lateral part and a bottom part are removed.

[0007]

An antireflective film 2 formed of, for example, a silicon nitride film is formed on the light receiving side of the solar cell element X. The antireflective film 2 is formed, for example, by plasma CVD method and has a function as a passivation film.

[0008]

Subsequently, after coating the surface and the back surface of the silicon substrate 1 with silver paste and with aluminum paste and silver paste, respectively, the silicon substrate 1 is baked to simultaneously form a surface electrode 5 and a back surface electrode 4.

[0009]

As shown in Fig. 3(a), the back surface electrode 4 is formed of back surface bus bar electrodes 4a for retrieving outputs from the back surface and back surface power collecting electrodes 4b. Also, as shown in Fig.

3(b), the surface electrode 5 is formed of surface bus bar electrodes 5a for retrieving outputs from the surface and surface finger electrodes 5b disposed so as to perpendicularly cross the surface bus bar electrodes 5a for power collection.

[0010]

The back surface power collecting electrodes 4b are formed by printing aluminum paste through screen printing and baking, and, by this formation, a back surface field layer for preventing recombination of carriers generated on the back surface is formed by diffusion of aluminum into the silicon substrate 1. Also, the back surface bus bar electrodes 4a, the surface bus bar electrodes 5a, and the surface finger electrodes 5b are formed by a method of printing silver paste through screen printing and baking. The surface electrode 5 is formed by eliminating a part of the antireflective film 2 corresponding to the electrode through etching in some cases or is directly formed on the antireflective film 2 by a method called "fire-through".

[0011]

Further, processing for facilitating provision of wiring for retrieving the output to the outside or coating a solder for maintaining durability of the electrode is performed on the electrode part of the solar cell element X in some cases, and dip coating, spray coating, or the like

is employed for the solder coating.

[0012]

In recent years, solar cells have been required to have even higher conversion efficiency due to increasing attention to environmental problems. Therefore, various devises have been made for the surface electrode (bus bar electrode 5a, finger electrode 5b) arranged on the light receiving surface. Generally, for example, means such as decreasing optical loss (reflectional loss) by fine wiring and disposing finger electrodes 5b and bus bar electrodes 5a orthogonal to each other so that electrons collected in the finger electrodes 5b are carried to the bus bar electrodes 5a with minimum loss have been used.

[0013]

Since power output generated by one solar cell element is small, it is necessary to connect a plurality of solar cell elements in series and in parallel to retrieve practical power output. As one example of the solar cell module, shown in Fig. 2(b) is a solar cell module Y formed by combining the solar cell elements X shown in Fig. 2(a).

[0014]

As shown in Fig. 2(b), the plurality of solar cell elements X are electrically connected with each other by using inner lead wires 8 and are air-tightly sealed with a filler member 10 that mainly contains ethylene vinyl

acetate copolymer (EVA) or the like, between a translucent panel 9 and a back surface protective member 11, so as to construct the solar cell module Y. The output of the solar cell module Y is coupled to a terminal box 13 through an output wiring 12. Shown in Fig. 2(c) is a partially enlarged view of an inner structure of the solar cell module Y of Fig. 2(b).

[0015]

As shown in Fig. 2(c), the surface bus bar electrode 5a of the solar cell element X1 and the back surface bus bar electrode 4a of the solar cell element X2 are connected by inner lead wires 8, so that a plurality of the solar cell elements are electrically connected. In general, one obtained by solder coating an entire surface of, e.g., a copper foil having a thickness of about 0.1 to 0.3 mm is used as the inner lead wires, and the inner lead wires 8 and the bus bar electrodes (4a, 5a) of the solar cell elements X are heated with a solder being interposed therebetween, followed by pressure-bonding over a part of a length or the whole length, thereby connecting the solar cell elements X to the inner lead wires 8 by the solder.

[Patent Publication 1] JP-A-2003-69055

[Disclosure of the Invention]

[Problems to be Solved by the Invention]

[0016]

The output characteristic of a solar cell element is represented by the following expression.

[0017]

Output characteristic (Pm) = Short circuit current (Isc) × Open voltage (Voc) × Fill factor (F.F.) ... (1).

A value obtained by dividing the output characteristic by an area of the solar cell elements is the conversion efficiency. The conversion efficiency is a value showing the output characteristic of solar cell elements per unit area, and improvement in conversion efficiency is a significant issue in the development of solar cell elements. In order to improve the conversion efficiency of the solar cell elements, it is necessary to improve each of the short circuit current, the open voltage, and F.F. indicated in the expression (1).

[0018]

Due to the increasing attention to environmental problems, there is a demand for achievement of higher efficiency of solar cells, and one of means for meeting such demand is an increase in light receiving area by a decrease in electrode area of the surface electrode.

[0019]

However, a problem is that, in particular, when finger electrodes are thinned to decrease the electrode area, a loss is generated due to an increase in resistance

within the electrode.

[0020]

To solve this problem, increasing the thickness of finger electrode thereby to increase the cross-section area within the electrode and reduce the resistance is considered. However, in reality, there is a limit to the thickness of electrodes when electrodes are formed by screen printing, and the desired thickness can only be obtained through a process including a plural times of printing and by using expensive equipments for sputtering and vapor deposition, thereby raising a problem of increase in production cost of solar cell elements.

[0021]

Therefore, a study on reduction in substantial resistance value by way of reduction in length of finger electrodes through increase in number of bus bar electrodes has been conducted.

[0022]

The present invention is accomplished in view of the above-described problems, and an object thereof is to provide a solar cell module with high efficiency.

[Means for Solving the Problems]

[0023]

A solar cell module according to claim 1 of the present invention is a solar cell module including a

plurality of flat plate solar cell elements electrically connected to one another and disposed between a translucent panel and a back surface protective member with a space between the adjacent solar cell elements being filled with a filler member, wherein each of the solar cell elements includes a light receiving surface electrode that is provided on a light receiving surface side of the solar cell element, the light receiving surface electrode including three bus bar electrodes for retrieving outputs and a plurality of finger electrodes disposed to perpendicularly cross the bus bar electrodes; each of the bus bar electrodes has a width of not less than 0.5 mm and not more than 2 mm; and each of the finger electrodes has a width of not less than 0.05 mm and not more than 0.1 mm.

[0024]

Also, in the solar cell module of the present invention, each of the finger electrodes has a width of not less than 0.06 mm and not more than 0.09 mm.

[0025]

Also, in the solar cell module of the present invention, the finger electrodes are in contact with the filler member.

[0026]

Further, in the solar cell module of the present invention, each of the solar cell elements is provided on

the light receiving surface side thereof with an opposite conductivity-type diffusion layer having a sheet resistance of not less than 60 Ω/□ and not more than 300 Ω/□.

[0027]

Furthermore, in the solar cell module of the present invention, each of the solar cell elements includes on the light receiving surface side thereof a great number of fine irregularities each having a width and a height of 2 μm or less and an aspect ratio of 0.1 to 2.

[Effect of the Invention]

[0028]

The solar cell module of the present invention is a solar cell module including a plurality of flat plate solar cell elements electrically connected to one another and disposed between a translucent panel and a back surface protective member with a space between the adjacent solar cell elements being filled with a filler member, wherein each of the solar cell elements includes a light receiving surface electrode that is provided on a light receiving surface side of the solar cell element, the light receiving surface electrode including three bus bar electrodes for retrieving outputs and a plurality of finger electrodes disposed to perpendicularly cross the bus bar electrodes; each of the bus bar electrodes has a width of not less than 0.5 mm and not more than 2 mm; and each of the finger

electrodes has a width of not less than 0.05 mm and not more than 0.1 mm. Thus, it is possible to obtain a solar cell module with high output and high efficiency.

[Best Mode for Carrying out the Invention]

[0029]

Hereinafter, a solar cell module of the present invention will be described in detail based on the accompanying drawings. Fig. 2(a) is a diagram showing a structure of a section of a solar cell element X concerning the solar cell module of the present invention. Fig. 1 is a diagram showing one example of an electrode shape, wherein (a) is a light receiving surface side (surface), and (b) is a non-light receiving surface (back surface).

[0030]

In Fig. 2(a), denoted by 1 is a p-type silicon substrate which is a semiconductor substrate; denoted by 1a is an n-type diffusion layer; denoted by 2 is an antireflective film; denoted by 3 is a semiconductor junction part; denoted by 4a is a back surface bus bar electrode; denoted by 4b is a back surface power collecting electrode; and denoted by 5a is a surface bus bar electrode.

[0030]

Hereinafter, a production process of the solar cell element X is described. First, the p-type semiconductor silicon substrate 1 made from monocrystalline silicon,

polycrystalline silicon, or the like is prepared. This silicon substrate 1 includes a unipolar semiconductor impurity such as boron (B) or the like in an amount of about 1×10^{16} to 1×10^{18} atoms/cm^3 and has a specific resistivity of about 1.0 to 2.0 Ω·cm. When a monocrystalline silicon substrate is prepared, the monocrystalline silicon substrate is formed by a pulling method or the like, and in the case of a polycrystalline silicon substrate, by a casting method or the like. Polycrystalline silicon substrates can be mass-produced and advantageous in terms of production cost over monocrystalline silicon substrates. An ingot produced by the pulling or the casting method is sliced into a thickness of about 300 μm, which are then cut to obtain the silicon substrate 1 of 15 cm × 15 cm in size.

[0032]

Thereafter, a cut surface of the substrate is etched to a small extent using hydrofluoric acid or hydrofluoric nitrate for cleaning.

[0033]

In order to effectively guide solar light into the element, irregularities are formed on the surface. It is possible to form the irregularities by a wet etching method of dipping the element into a sodium hydroxide (NaOH) solution, potassium hydroxide solution (KOH), or the like,

a dicing method, a reactive ion etching method, or the like. In the case of using the monocrystalline silicon substrate, it is possible to form uniform irregularities by any one of the methods. Though the wet etching method, which enables to form the irregularities by way of the difference in etching speed caused by a crystal orientation, is capable of achieving a certain level of decrease in reflectance, it is difficult to form the uniform irregularities by the wet etching method, and it is difficult to achieve satisfactory reflectance reduction. The reflectance reduction is a means that is very effective for improvement in short circuit current of the solar cell element. When a great number of fine irregularities each having a width and a height of 2 μm or less and an aspect ratio of 0.1 to 2 are formed, it is possible to particularly effectively reduce the reflectance and to improve conversion efficiency of the solar cell element.

[0034]

Subsequently, with the silicon substrate 1 situated in a diffusion furnace, a heat treatment is carried out in a gas including an impurity element such as phosphorous oxychloride ($POCl_3$). By this process, phosphorus atoms are diffused into a surface region of the silicon substrate 1 so that the n-type diffusion layer 1a having a sheet resistance of about 60 to 300 Ω/□ is formed, thereby

obtaining the semiconductor junction part 3. When the sheet resistance is less than 60 Ω/□, the diffusion layer is too deep to improve the short circuit current sufficiently. On the other hand, when it is greater than 300 Ω/□, the diffusion layer is so shallow that destruction of pn junctions can occur during the formation of electrodes in a later process, or adequate adhesion strength cannot be achieved between the substrate and the electrodes.

[0035]

Subsequently, in order to remain a portion of the n-type diffusion layer 1a on the surface side of the silicon substrate 1, the other portions are removed, followed by cleaning with pure water. The removal of the n-type diffusion layer 1a formed on regions other than the surface side of the silicon substrate 1 is carried out by applying a resist film on the surface side of the silicon substrate 1, and then etching with a liquid mixture of hydrofluoric acid and nitric acid, and finally removing the resist film.

[0036]

Subsequently, the antireflective film 2 is formed on the surface side of the silicon substrate 1. The antireflective film 2 is formed of, e.g., a silicon nitride film and is formed by a plasma CVD method for bringing a mixture gas of silane (SiH_4) and ammonium (NH_3) into a

plasma state by glow discharge decomposition for deposition. The antireflective film 2 is formed in such a manner as to achieve a refractive index of about 1.8 to 2.3 and a thickness of about 500 to 1000 angstroms in view of a refractive index difference with the silicon substrate 1. The silicon nitride film has an effect of improving electric characteristics of a solar cell in combination with the function of antireflection due to the passivation effect caused during the formation.

[0037]

After that, with silver paste applied on the surface, and with aluminum paste and silver paste applied on the back surface, the silicon substrate 1 is baked to form the surface electrode 5 and the back surface electrode 4.

[0038]

As shown in Fig. 1(a), the back surface electrode 4 is formed of the back surface bus bar electrodes 4a for extracting outputs from the back surface and the back surface power collecting electrodes 4b. As shown in Fig. 1(b), the surface electrode 5 is formed of the surface bus bar electrodes 5a for extracting outputs from the surface, and surface finger electrodes 5b provided so as to perpendicularly cross the surface bus bar electrodes for power collection.

[0039]

The back surface power collecting electrodes 4b are deposited such that an organic vehicle and glass frit are mixed with aluminum powder at a ratio of 10 to 30 parts by weight, and 0.1 to 5 parts by weight, respectively, per 100 parts by weight of aluminum to produce aluminum paste, which is then printed, for example, by a screen printing method and dried. Thereafter, it is baked at a temperature of 600°C to 800°C for about 1 to 30 minutes. During this process, the aluminum diffuses into the silicon substrate 1 to form a back surface field layer that prevents carriers generated at the back surface from being recombined.

[0040]

The back surface bus bar electrodes 4a, the surface bus bar electrodes 5a, and the surface finger electrodes 5b are deposited such that an organic vehicle and glass frit are mixed with silver powder at a rate of 10 to 30 parts by weight, and 0.1 to 5 parts by weight, respectively, per 100 parts by weight of silver to produce silver paste, which is then printed, for example, by a screen printing method and dried. Thereafter, they are baked at a temperature of 600°C to 800°C for about 1 to 30 minutes at once. The surface electrode 5 may be formed after the region of the antireflective film 2 that corresponds to the electrodes are removed by etching, or may be directly formed over the antireflective film 2 by a technique called fire through

process.

[0041]

In the solar cell element according to the present invention, each of the three bus bar electrodes has a width of not less than 0.5 mm and not more than 2 mm, and each of the finger electrodes has a width of not less than 0.05 mm and not more than 0.1 mm.

[0042]

When the width of the bus bar electrode is less than 0.5 mm, the resistance of the bus bar electrodes is increased, thereby undesirably increasing the resistance of an inner lead wire that is connected to the bus bar electrodes in the later process. On the other hand, in the case where the width exceeds 2 mm, although the resistance of the bus bar electrodes can be decreased adequately, the electrodes become excessively thick to an extent that the electrode area of the surface electrode increases, causing the light receiving surface area to be reduced, by which the conversion efficiency of the solar cell element may also undesirably drop.

[0043]

In the case where the width of the finer electrode is less than 0.05 mm, the resistance of the finger electrodes is undesirably increased. On the other hand, in the case where the width exceeds 0.1 mm, although the resistance of

the finger electrodes can be decreased adequately, the electrodes become excessively thick to an extent that the electrode area of the surface electrode increases, causing the light receiving surface area to be reduced, by which the conversion efficiency of the solar cell element may also undesirably drop.

[0044]

In the solar cell module according to the present invention, the electrode surface of the solar cell element is not covered with any solder. By such a structure, it is possible to obtain the solar cell module with enhanced properties.

[0045]

Since single solar cell element can generate only a small amount of power output, it is necessary to connect a plurality of the solar cell elements in series and in parallel so as to generate practical power output. As one example of the solar cell module, a solar cell module Y constructed by combining the solar cell elements X of Fig. 2(a) is shown in Fig. 2(b).

[0046]

As shown in Fig. 2(b), a plurality of solar cell elements X are electrically connected by the inner lead wires 8 and air-tightly sealed between a translucent panel 9 and a back surface protective member 11 by a filler

member 10 containing an ethylene vinyl acetate copolymer (EVA) or the like as a main component to form the solar cell module Y. Outputs from the solar cell module Y are connected to a terminal box 13 via an output wiring 12. As described above, the solar cell module according to the present invention is accomplished.

[0047]

Fig. 2(c) is a partially enlarged view of an inner structure of the solar cell module Y of Fig. 2(b).

[0048]

As shown in Fig. 2(c), the surface bus bar electrode 5a of the solar cell element X1 and the back surface bus bar electrode 4a of the adjacent solar cell element X2 are connected by the inner lead wire 8 so that the plurality of solar cell elements X are electrically connected to one another. The inner lead wire 8 is connected to a whole length or a plurality of parts of the back surface bus bar electrode 4a and the surface bus bar electrode 5a by heat welding such as hot air for connection and wiring of the solar cell elements X. For the inner lead wire 8, for example, one obtained by cutting a copper foil having a thickness of about 100 to 300 μm whose entire surface is coated with a solder having a thickness of about 20 to 70 μm, into predetermined lengths is used.

[0049] In the present invention, the bus bar

electrodes (4a, 5a) of the solar cell elements X are not preliminarily coated with any solder, and the solar cell elements X and inner lead wires 8 are connected by melting the solder that covers the inner lead wires 8.

[0050]

Meanwhile, implementation of the present invention is not limited to the foregoing embodiment, and various modifications may be made without departing from the spirit and scope of the present invention.

[0051]

While the description above is given to solar cells using p-type silicon substrates, also in cases where n-type silicon substrates are used, only by reversing the polarity in the description, the effect of the present invention can be achieved using the same process. In addition, while in the foregoing description, a single junction type solar cell module is described, the present invention is applicable also to multijunction stacked type solar cell modules formed by laminating thin film bonding layers comprising a semiconductor multilayer film on a junction device using a bulk substrate.

[0052]

Furthermore, while the foregoing description takes a polycrystalline silicon substrate fabricated by a casting method as an example, it is not necessary to limit the

substrate to that obtained by the casting method.

[Examples]

[0053]

Hereinafter, the results of experiments conducted on solar cell elements fabricated according to the foregoing embodiment will be described. Note that the present invention is not limited to the examples.

[0054]

As the substrate, a flat plate p-type polycrystalline silicon substrate of 150 × 150 mm in size fabricated by a casing method having a specific resistivity of 2 Ω·cm was used.

[0055]

A paste containing silver as a main component was printed and baked to form a surface electrode according to the solar cell element of the present invention. The pattern for the surface electrode as a whole was formed by disposing three lines of bus bar electrodes 1 including one vertical line at the center of the substrate and two lines axisymmetrically thereto. The bus bar electrodes 1 were made to have a length of 148.8 mm. The widths of the bus bar electrodes 1 were varied to 0.6, 0.8, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0 mm. The distance between the center lines of the bus bar electrodes was 49.3 mm. The length of finger electrodes from one end to the other end of the substrate

(including the widths of bus bar electrodes 1 crossing therebetween) that are arranged perpendicular (horizontal direction of the substrate) to the bus bar electrodes and axisymmetrically to the vertical center line of the substrate was 149 mm. The average distance between the center lines of adjacent finger electrodes was 2.4 mm. Solar cell elements were fabricated by varying the width of the finger electrodes 2 between 10 to 200 μm. Thereafter, 48 samples of the solar cell elements were connected together by inner lead wires each having the same width as that of each of the bus bar electrodes to produce a solar cell module, and output characteristics were measured.

[0056]

Tables 1, 2, and 3 show short circuit current (Isc), Fill Factor (FF), and conversion efficiency (Effi.) per solar cell element, respectively, converted from the output characteristics of the solar cell module.

[Table 1]

1: Short Circuit Current (A)

2: Finger Electrode Width (mm)

3: Bus Bar Electrode Width (mm)

[0057]

[Table 2]

1: Fill Factor

2: Finger Electrode Width (mm)

3: Bus Bar Electrode Width (mm)

[0058]

[Table 3]

1: Conversion Efficiency (%)

2: Finger Electrode Width (mm)

3: Bus Bar Electrode Width (mm)

[0059]

As is apparent from these tables, under the condition where the width of the bus bar electrodes is 1.4 to 2 mm, as the width of finger electrodes narrows, the short cut current increases, and the FF value decreases. Under the condition where the width of bus bar electrodes is 0.6 to 1.2 mm, as the width of finger electrodes increases, the FF values increase, but the short circuit current values peak at widths between 0.02 and 0.06 mm of finger electrodes.

[0060]

However, the conversion efficiencies were as high as more than 16% at widths of 0.04 to 0.11 mm of finger electrodes irrespective of the width of bus bar electrodes. In particular, the conversion efficiencies peak at widths of 0.06 to 0.09 mm of finger electrodes through the offset between the short circuit current and FF, under any width

condition of the bus bar electrodes.

[Brief Description of the Drawings]

[0061]

[Fig. 1] (a) is a diagram showing a solar cell element to be used for a solar cell module according to the present invention as viewed from a back surface, and (b) is a diagram showing the solar cell element to be used for the solar cell module according to the present invention as viewed from a surface.

[Fig. 2] (a) is a diagram showing a section of the solar cell module according to the present invention, and (b) and (c) are diagrams each showing a section of the solar cell module according to the present invention.

[Fig. 3] (a) is a diagram showing a conventional solar cell element as viewed from a back surface, and (b) is a diagram showing the conventional solar cell element as viewed from a surface.

[Description of Reference Numerals]

[0062]

1: silicon substrate (semiconductor substrate)

1a: n-type diffusion layer

2: antireflective film

3: semiconductor junction part

4: back surface electrode

4a: back surface bus bar electrode

4b: back surface power collecting electrode

5: surface electrode

5a: surface bus bar electrode

5b: surface finger electrode

6: solder

7: solder resist

8: inner lead wire

9: translucent panel

10: filler member

11: back surface protective member

12: output wiring

13: terminal box

X, X1, X2, X3: solar cell element

Y: solar cell module

[Document Name] Abstract

[Abstract]

[Object] To provide a solar cell module having high efficiency.

[Solution] A solar cell module including a plurality of flat plate solar cell elements X that are arranged at predetermined intervals between a translucent panel 9 and a back surface protective member 11 and are electrically connected to one another with a space between the adjacent solar cell elements being filled with a filler member 10, wherein each of the solar cell elements X includes a light receiving surface electrode that is provided on a light receiving surface side of the solar cell element, the light receiving surface electrode including three bus bar electrodes 5a for retrieving outputs and a plurality of finger electrodes 5b disposed to perpendicularly cross the bus bar electrodes 5a; each of the bus bar electrodes 5a has a width of not less than 0.5 mm and not more than 2 mm; and each of the finger electrodes 5b has a width of not less than 0.04 mm and not more than 0.11 mm.

[Selected Drawing] Fig. 1